DOCUMENT RESUME

ED 304 344 SE 050 448

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TITLE Knowing without Metaphysics: Aspects of the Radical Constructivist Position.
INSTITUTION Kitchener-Waterloo Record, Kitchener (Ontario).
REPORT NO SRRI-208
PUB DATE Jan 89
NOTE 26p.
PUB TYPE Viewpoints (120) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Processes; *Cognitive Structures; Educational Philosophy; Educational Theories; *Epistemology; *Learning Processes; *Learning Theories; Philosophy; *Science Education
IDENTIFIERS *Constructivism

ABSTRACT

Like any apparently novel approach to the basic epistemological problems of "knowledge," the constructivist ideas that have spread in the last 20 years continue to generate a host of negative as well as a few positive reactions. This document focuses on some aspects of Radical Constructivism, as distinct from "trivial" constructivism, and attempts to show that the major objections that have been raised against it are due to gross misinterpretation and turn out to be vacuous once the position is made a little clearer. Discussions include historical perspectives, key concepts of radical constructivism, perspectives on reality and knowledge, and learning as construction. A list of 29 references is included. (Author/CW)

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Knowing without Metaphysics:

Aspects of the Radical Constructivist Position

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Knowing without Metaphysics: Aspects of the Radical Constructivist Position*

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We shall not think that by being "scientific" or "philosophical" one genre of writing can attain an "objectivity" which another, "literary", cannot.
Richard Rorty, 1983, p.174

I. INTRODUCTION

Like any apparently novel approach to the basic epistemological problems of "knowledge", the constructivist ideas that have spread in the last twenty years continue to generate a host of negative as well as a few positive reactions. In this chapter I shall focus on some aspects of Radical Constructivism, as distinct from "trivial" constructivisms,' and try to show that the major objections that have been raised against it are due to gross misinterpretation and turn out to be vacuous once the position is made a little clearer.

I begin with a brief historical review of key ideas that were crucial for the development of the constructivist position. Needless to say, this review will be biased and, given the limitations of space, incomplete. Then I shall deal with the frequent complaint that constructivism denies the existence of any reality and counter it by explaining some of the steps involved in the construction of what I have called *experiential reality*. Ideally this should add up to a demonstration that the constructivist approach to the problem of knowledge is a feasible one.

Ultimately, of course, a way of thinking must not only be claimed feasible but, in order to become attractive, its advantages must be shown in action. Other contributions to this volume will no doubt present practical reasons why such a departure *from* traditional theories of knowledge would seem desirable. Hence I shall confine myself to outlining the one application of constructivist principles in which I

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* Chapter in F.Steier (Ed.), Research and Reflexivity: Toward a cybernetic/social constructionist way of knowing. London: Sage Publications, in press. January, 1989

myself have been involved and which, by now, is showing encouraging signs of success: early education.

Lest my sometimes quite passionate way of arguing *for* constructivism be interpreted as an attempt to insinuate that it and it alone is "right", let me hasten to say that this is not my intention. I would be contradicting one of the basic principles of my own theory if I were to claim that the constructivist approach provides a *true* description of an *objective* state of affairs. As I see it, Radical Constructivism merely provides a different way of thinking and its value will depend mainly on its usefulness in our experiential world and only marginally on what professional philosophers have to say about it.

II. HISTORICAL SOURCES

Radical Constructivism was conceived as an attempt to circumvent the paradox of traditional epistemology that springs from a perennial assumption that is inextricably knitted into Western philosophy: the assumption that knowledge may be called "true" only if it can be considered a more or less accurate *representation* of a world that exists "in itself", prior to and independent of the knower's experience of it. The paradox arises, because the works of philosophers by and large imply, if not explicitly claim, that they embody a path towards Truth and True representations of the world, yet none of them has been able to provide a feasible test for the accuracy of such representations.

The contemporary trends that, collectively, could be referred to as Constructivism, can be traced back to ideas that were launched independently by thinkers who, except for the most recent, either did not know of one another or had no relevant interaction. If and when a history of constructivism will be written, it should show, among other things, the extent to which professional thinkers and philosophers "do their own thing", argue virulently and sometimes effectively against others that hold divergent views, but almost

completely disregard (or happen to be ignorant of) anyone who might have worked in a direction similar to their own. Thus, several of the key ideas had to be invented time and time again.

Scepticism

The original seed of constructivist ideas was undoubtedly the sceptics' realisation that we can have no certain knowledge of the real world, because, even if we could discover how our knowledge is derived from experience, there is no way of discovering how our experience might be related to what there *is* before we experience it. This realisation is inherent in some of the fragments of the Pre-Socratics from the 6th century B.C. It was fully developed by Pyrrho's school in the 3rd century B.C. and diligently documented by Sextus Empiricus some five hundred years later. It became the core of "apophatic" theologians of the 4th century A.D. in Byzantium, who affirmed "the absolute transcendence of God and excluded any possibility of identifying Him with any human concept... for no human word or thought is capable of comprehending what God *is*." (Meyendorff, 1974;p.11) This strict limitation of human understanding was kept alive and generalized by the sceptics of later ages (e.g. Montaigne, Mersenne, Berkeley, Hume) who applied it to rational knowledge as such. Kant, then, produced its final formulation in his *Critique of pure reason* [2], which all subsequent philosophers have unsuccessfully struggled to undo.

Scientific Truth

The second key idea concerns the status of science. That scientific knowledge should not be taken as a picture of the "real" world was clearly formulated by Osiander in his preface to Copernicus' work on the motion of planets and some seventy years later by Cardinal Bellarmino in the context of Galileo's trial.[3] Both of them suggested that science and its computations should be considered *instrumental* in the prediction of experiences but must never claim to capture God's truth. These two theologians, one a Protestant, the other a Catholic, took this position to protect their faith

and its sources in dogma and revelation from being undermined by scepticism and scientific arguments. They thus, for religious reasons, laid the foundation of Instrumentalism, which came to its full worldly development with Ernst Mach (1905), Aleksandr Bogdanov (1909), and the Pragmatists at the beginning of our century.

The Nature of Concepts

The third key idea is that of cognitive construction. To my knowledge it was first suggested by the Italian philosopher Giambattista Vico (1710) who coined the phrase I have often quoted: "God is the artificer of man, man the god of artifacts." He explained this by saying that, in order to know something, one had to know how and out of what it was made. Hence, God alone can know the real world, because it was He who created it; the human knower, analogously, could know only what humans have constructed.

Another thinker who took up the notion of conceptual construction and produced a truly remarkable compendium of detailed analyses was Jeremy Bentham. He developed his *Theory of Fictions* between 1760 (when he entered Oxford at the age of twelve and a half!) and 1814, when he published his first systematic exposition. He concluded: "To language, then--to language alone--it is that fictitious entities owe their existence; their impossible, yet indispensable existence."[4] Bentham's work supplied conceptual analyses that should be of great interest to contemporary constructivists. They are, in fact, the first "operational" recipes for the construction of concepts and anticipate in some instances the "operational definitions" of Percy Bridgman (1936)[5] and the "operational semantics" of Silvio Ceccato (1964-66).

Adaptation

Fourth, there is the evolutionary idea. William James (1880) was apparently the first to suggest that the evolution of knowledge could be mapped by using the central concepts of Darwin's theory, namely *natural selection* and *adaptation*. Since then, this idea was picked up or independently

developed by thinkers with very different backgrounds and in different places.[4]

Hans Vaihinger, apparently without drawing on the much earlier analyses of Jeremy Bentham, created the most comprehensive and consistent work on conceptual "fictions". His *Philosophy of as if* (1913)[5] has become particularly interesting today, given the revolution in the philosophy of science and the recognition that, even in the "hard" sciences, key concepts can be considered *convenient ideal fictions*. While Vaihinger provides endless ammunition for contemporary constructivists, I would not classify him as "radical", because when everything is said and done, he anchors the conceptual apparatus that produces the "fictitious" concepts in the theory of biological evolution. In doing so, he tacitly attributes ontological status to that theory.[6]

III. THE RADICAL DIFFERENCE

All present constructivist proposals are indebted to one or several of these historical thinkers. Radical Constructivism coordinates and integrates the four "key ideas" I have listed and, in doing so, decidedly steps out of the epistemological tradition to which, in one way or another, all these thinkers, with the exception of Vico, still subscribed. What differentiates Radical Constructivism from the tradition, is the proposal unequivocally to give up the notion that knowledge ought to be a veridical "representation" of a world as it "exists" prior to being experienced (i.e. ontological reality). This was formulated by several authors the beginning of this century. Here I shall mention only two later ones who incisively influenced my organization of ideas I had picked up over the years: Silvio Ceccato and Jean Piaget.

Silvio Ceccato, with whom I was privileged to work for some fifteen years in Italy, developed Bridgman's idea of operational definitions into a comprehensive system of *mental operations*. He emphasized the "constitutive" capability of the mind and the role of a pulsating attention that

governs the generation of concepts by separating and relating the raw material of sensory differences. On these premises he worked out a detailed model of a thinking organism that was able to construct an experiential world without "representational" input from an external reality (Ceccato, 1964-66).

Jean Piaget launched the notion of constructivism in developmental psychology. As I interpret his work (von Glasersfeld, 1982), it is the direct consequence of two fundamental insights: (1) that cognition produces conceptual structures by *reflective abstraction* from material that is available within the system and from the operations carried out with that material; and (2) that the function of cognition is *adaptive* in the biological senses. (Piaget, 1937, 1967). To realise the full power of the second, one must grasp the idea that adaptation is not an activity, but the result of the elimination of the non-adapted, the non-functioning, and that, consequently, anything that manages to survive *is* "adapted" to the environment in which it happens to find itself living. Once this is understood, one realizes that what matters is not to *match* the world, but to *fit* into it in spite of whatever obstacles or traps it might present. Applied to cognition, this means that "to know" is not to possess "true representations" of reality, but rather to possess ways and means of acting and thinking that allow one to attain the goals one happens to have chosen. Knowledge, thus, is not "correct pictures", but, *viable* procedures or, as Maturana would say, "effective ways of acting".

Functional Fit

To embark on the *radical* constructivist path, thus, means to relinquish the age-old untestable requirement that knowledge must *match* the world as it might "exist" independently of our experience; instead, one demands of knowledge that it prove itself by a *functional fit.* From my perspective, those who merely speak of the construction of knowledge, but do not explicitly give up the notion that our conceptual constructions can or should in some way *represent* an independ-

ent, "objective" reality, are still caught up in the traditional theory of knowledge that is defenseless against the sceptics' arguments. From an epistemological point of view, therefore, their constructivism is *trivial*.

IV. NO DENIAL OF REALITY

One of the standard objections to constructivism, particularly *radical* constructivism, runs somewhat like this: "There's a book in front of you on the table, you know it's a book, I know it's a book, and anyone who looks at it would recognize it as a book--why do you keep telling us that the book is not *really* there?" -- To give anything like a complete answer to this question, one would have to explicate at least all the key ideas of the constructivist approach I have listed above, and one would have to reiterate that constructivism deals with *knowing* not with *being*. There is no simple argument to justify the distinction between experiential reality and ontological reality. One might reply that life would be a lot easier if no one claimed to know the world as it *is*, and that the constructivist orientation is one way to avoid such claims. As a constructivist, I have never said (nor would I ever say) that there is *no* ontic world, but I keep saying that we cannot *know* it. I am in agreement with Maturana when he says:

> ... an observer has no operational basis to make any statements or claim about objects, entities or relations as if they existed independently of what he or she does. (1988:p.30)

I, too, arrived at this conclusion, albeit by a path that was quite different from his: I started from the sceptics, he from biology. The crucial point is that we do not make claims of knowing what exists "in itself", i.e., without an observer or experiencer. I, for one, am talking about what we *know* or *can know*. And as far as our knowledge (not God's knowledge) is concerned, I claim that we cannot even imagine what the word "to exist" might mean in an ontological context, because we cannot conceive of "being" without the no-

tions of space and time, and these two notions are among the first of our conceptual constructs.[10]

To perceive or recognize a book (or anything else) is to find something in one's experiential field that *fits* one's concept of "book". It does not mean that a "real" or "ontic" object that *is* a book has to *be there* before one has seen it as a book. All it means is that in some part of our present experiential field there is the kind of raw material which, if coordinated in a particular way, is sufficiently close to what our concept of book demands, so that we accept it as an instantiation of that concept.

Two points have to be made clear in this context because they, too, have led to misunderstandings. First, "concepts", in my view, are not like picture postcards against which one matches experiential material; rather, they are pathways of action or operation and they can either be completed with the experiential material at hand, or they can not; and the rigor with which that completion is required and carried out always depends on the particular setting in which the activity takes place. The second point concerns what I have called the "raw material". The "stuff" on this lowest level of analysis is not something that lies about in an objective environment. It is no more, but also no less, than the totality of basic sensory elements or distinctions" our system is able to generate.

Concepts, therefore, have no iconic or representational connection with anything that might "exist" outside the cognizing system; and the raw material out of which concepts are composed or coordinated cannot be *known* to have any such connection either. To call the basic elements of our cognitive conceptual constructions "distinctions" is, I think, the least misleading way of speaking about them. From the distinguisher's point of view, what is actually distinguished depends, not on what might be there before the activity of distinguishing is carried out, but on what the organism is able to distinguish and chooses to distinguish in the given experiential context.

V. THE CONSTRUCTION OF EXPERIENTIAL REALITY

If one adopts a constructivist orientation, one is obliged to go beyond the mere proclamation that the world we experience is a world we construct. At least one must try to show *how* what we call "knowledge", i.e. our successful ways and means of managing our lives and conceptual structures could be built up; and if one claims to be a *radical* constructivist, one must also show that this experiential world can be built up without reference to a supposedly "existing" world. I shall try to illustrate this possibility by sketching out at least the beginnings of conceptual construction.

Before any one of us comes to ask an epistemological question, he or she has lived for quite some time and gained a good deal of know-how in categorizing, avoiding, and also provoking experiential situations. We gain much of this practical knowledge early in life, and it reflects "reality" to us, because it deals with what our lives consist of. In today's social climate it happens rarely before puberty--if at all--that we reflect upon our praxis. Then, perhaps standing before a looking glass one day, a strange bubble rises to our consciousness: "Who am I?" or "How do I know this is me?" Thus begins philosophical investigation.

To answer the perplexing questions, we have to retrace our path almost to the beginning--to where we made the first distinctions in our experiential field.

Near the end of his book *The Construction of Reality in the Child* (1937), Piaget uses a simple drawing to illustrate his approach to the question of how cognitive development begins. The drawing consists essentially of a small circle, framed by a much larger concentric one. It shows what Spencer Brown (1969), thirty years later, would call "the first distinction", and it is, in Spencer Brown's terms, as yet "unmarked". That is to say, no characteristics have been ascribed to the distinguished areas, one inside, the other outside the framed circle. Descriptions follow, as the child makes further distinctions that separate it from an "en-

vironment". Thus the inside becomes "self", the outside the individual's "universe".

This first distinction, as I have frequently said, is analogous to the one the artist makes with the first few lines on a sheet of paper, lines that determine what is going to be "figure" and what "ground". For the point of view I have adopted, the most important thing about that distinction is not *what* is being distinguished, but that the artist makes the distinction *within* the sheet, the canvas, or whatever he happens to be drawing on. Both figure and ground are parts of one and the same sheet. This is the feature traditional epistemology has tended to obscure: the distinction between the self and its environment is made, and can only be made, within an observer's field of experience and does *not* concern the distinction between the observing subject and an "objective" world to be observed or known. In other words, the self we come to know and the world we come to know are both assembled out of elements of our very own experience.

The construction of the more mature "self", the "self" that has properties, relations, and a continuous identity, is a lengthy process consisting of many sequential steps. Foreshortening the path, the following may be more or less common experiences. The infant that grasps, pulls, and pushes whatever its fingers can get a hold of, begins, at a certain point of its development, to differentiate between grasping its own finger or toe, as opposed to grasping a bar of the cot or the handle of a rattle. The one generates a tactual sensation, maybe even a slight "pain", the other does not. This sort of experience leads to the construction of the physical boundaries of one's body. Similarly, the infant will come to differentiate between moving an arm to reac.. something and having its arm moved, for instance, when, while being dressed, the arm is fitted into a sleeve by someone else. This leads to the notion of voluntary movement.-- Years later the child may notice that her hand hurts as she is holding on to the leash of an unruly dog, but she

deliberately disregards the pain because she does not want to let go. This leads to the notion that the focus of one's attention can be shifted at will.

There are, indeed, innumerable experiences that provide an opportunity to differentiate "oneself" from the world in which one lives. Some of them generate awareness of the physical boundaries of the body one comes to call one's own; others generate the awareness that moving oneself is different from the movement of "external" things; and still others bring home the fact that, at least within certain limits, one can voluntarily direct one's attention towards and away from particular areas of the experiential field.

The early stages of this progression are part and parcel of the development that Piaget (1964) called a Copernican Revolution at the end of which, "when language and thought begin, (the child) is for all practical purposes but one element or entity among others in a universe that he has gradually constructed himself, and which hereafter he will experience as external to himself." (p.9)

Two aspects of this development are crucial for an understanding of Radical Constructivism. First, all this distinguishing and constructing of one's "self" takes place *within* the experiential field; uses elements of the sensory manifold; and is the result of the experiencer's own actions. It does not require "things-in-themselves" or "distinctions-in--themselves" that could be ascribed to an objective, ontological reality. Second, what is isolated and established in this way, is the self one experiences--it is not that mysterious central entity that *does* the experiencing.

The constructs with which we have furnished our experiential world are those we have found useful or, at least, tenable. We use them in our schemes of action and in our conceptual operations; we drop or modify them if their rate of failure gets too high and we are able to construct more reliable ones; and we try to balance and coordinate them among each other. The more generally they are applicable, the less

of them we need. And, given the variety of situations we come to disinguish, economy in the number of schemes becomes an important consideration.

In all this there is an aspect that was clearly stated by Piaget but was mostly ignored or misunderstood by both his followers and his critics. The experiential environment in which an individual's constructs and schemes must prove viable is always a *social* environment as well as a *physical* one. And it is precisely the social aspect that furnishes the key to the solidification of the individual's experiential reality (von Glasersfeld, (1985).

Just as language arises and becomes a relatively stable system through the continual interaction of the individuals that use it, so a great many of the conceptual schemes that individuals construct are reinforced through their application in social interaction. This is a subtle, complicated issue and I shall try to explicate it with an example that may seem absurdly simple.

Assuming you have made an appointment with a friend to meet in a certain place on a certain day. When the day comes, a lot of snow has fallen during the preceding night. There is a shorter and a longer way to drive to the arranged place. Because you know from your own experience that the longer way is the quicker when there is snow on the roads, you predict that your friend will come by that route. If your prediction turns out to be correct and, especially, if your friend confirms that he chose the longer way for the reason that you had in mind, your reasoning will be greatly reinforced and the elements that were involved in it will seem more like an objective reality that is independent of both of you.

As I said, this is an absurdly simple example, but I have no hesitation about generalizing it: If a prediction, made on the basis of imputing to another person a scheme of acting or thinking that one has found to be viable for oneself, turns out to be correct, then that scheme and the conceptual structures it involves achieve a level of experiential real-

ity that cannot be reached without the social context. Indeed, this kind of "corroboration" produces the only *objectivity* that is possible in the Radical Constructivist view.

Incidentally, the explicit condition that the highest level of experiential reality can be achieved *only* through interaction with other cognitive entities, constitutes a highly unusual feature: it shows that in the Radical Constructivist view, the need to consider *others* is not an ethical assumption but an epistemological requirement (von Glasersfeld, 1986).

VI. LEARNING AS CONSTRUCTION

Some educators and researchers in education have come to the conclusion that, as a foundation for their activities, they must develop some theoretical ideas as to how children build up their picture of the world they experience. They believe that unless they have a model of the student's concepts and conceptual operations, there is no effective way of teaching. In other words, they have begun to think in terms not only of cognitive but also of developmental psychology. This is a far cry from the still wide-spread behavioristic orientation that focuses exclusively on *training* and disregards *learning*.

As long as the educator's objective was the generation of more or less specific behaviors in the student, the educator saw no need to ask what, if anything, might be going on in the student's head. Whenever the student could be got to "emit" the desired behaviors in the situations with which they had been associated, the instructional process was deemed successful. The student did not have to *see* why the particular actions led to a result that was considered "correct", nor did the educator have to worry about how the student achieved it; what mattered was the "performance", i.e., that he or she was able to produce such a result.

If, in contrast, the objective is to lead the children or students to some form of *understanding*, the teacher must have some notion of how they think. That is to say, teachers

must try to infer, from what they can observe, what the students' concepts are and how they operate with them. Only on the basis of some such hypothesis can teachers devise ways and means to orient, direct, or modify the students' mental operating. This is a context in which the constructivist approach and its analysis of conceptual development seemed promising.

In spite of Piaget's seminal work, that area is still to a large extent *terra incognita*. Besides, it is an area in which there are likely to be no ultimate "laws of nature". On the other hand, we have seen enough of it to say that we can formulate rules that have a remarkably wide application. In a recent report, my colleague Les Steffe and I wrote:

> Working with children is in many ways like working with foreigners with whom one has only fragments of a language in common. The situation is extreme when the work involves numbers and mathematical operations and aims at developing some insight into how a given child thinks of numbers and how he or she operates with them. Anyone who has seriously tried to investigate what actually goes on in a child's head when that child is struggling to solve an addition or subtraction problem at the limit of his or her present capability, will have realized that the child's mathematical world is indeed outlandish from the adult's point of view. Yet, children who have not been totally alienated from the number game and have at least a modicum of motivation do not act randomly. They do proceed according to some method, even if that method would seem unorthodox to the experienced reckoner. To get an inkling of what that method might be, the investigator cannot but use his or her own imagination and try to conceive a reasonable path that might connect such manifestations of the child's operating as can be observed, with steps that could possibly lead to an answer to the given question. That is to say, no

> matter how hard investigators try to adapt their analyses to the "foreign" ways of the child, the model they build up will always be a model constructed out of concepts that are necessarily the investigators'. Because the child's way of thinking is never directly accessible, the investigators' model can never be compared to it in order to determine whether there is or is not a perfect match. The most one can hope for is that the model *fits* whatever observations one has made and, more importantly, that it remains viable in the face of new observations.

The Illusion of Communication

Such models of another's mental operations necessarily remain hypothetical. There are no "hard" observable facts about another thinker's concepts and mental operations. This is the case not only in educational research and teaching, but surely also in therapy. For psychologists this is a difficult idea to swallow, because they have for a long time lived with the idea that there is such a thing as linguistic confirmation of one's interpretation of another's thoughts. This belief was based on an untenable conception of "communication". If the constructivist movement has done anything at all, it has dismantled the image of language as a means of *transferring* thoughts, meanings, knowledge, or "information" from one speaker to another. The interpretation of a piece of language is always in terms of concepts and conceptual structures which the interpreter has formed out of elements from his or her own subjective field of experience. Of course, these concepts and conceptual structures had to be modified and adapted throughout the interactions with other speakers of the language. But adaptation merely eliminates those discrepancies that create difficulties in actual interactive situations--adaptation ceases when there seems to be a *fit*. And fit in any given situation is no indication of *match*. To find a fit, simply means not to notice any discrepancies.

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The models of another's conceptual operating that one can build on the basis of observable behavior, thus, are and remain hypthetical; and what, one might ask, is the use of such models if they are linked to the reality of the child's thinking, not by hard facts, but by inferences that may be countermanded at any moment? The constructivist answer is simple and perhaps disconcerting: the experiential world we live in (including other persons) is always a collection of such conjectural models based on one's own interpretation of what one sees, hears, and "understands". Linguistic communication is no exception to this rule. There, too, one deals with *fit*, not with *match*. Language does not transport pieces of one person's reality into another's--it merely prods and prompts the other to build up conceptual structures which, to this other, seem compatible with the words and actions the speaker or writer has used.[12]

The Interpretation of Experience

Though there is no way to get around the uncertainty inherent in all conjectures about another's mental states and processes, it would be foolish to say that this uncertainty makes the conjectured models useless. As long as the models we construct help us to solve the problems that concern us, their ontological status ought not to worry us. This has been well documented in theoretical physics.[13] It can be seen even more clearly in medicine, as soon as we step out of the traditional realist framework. Take the procedure a physician uses when he makes a diagnosis. When certain features, observed in a patient's appearance, behavior, or reports, are recognized as the characteristic symptoms of a particular disorder, it is the outcome of an *interpretation*. And this interpretation is possible only on the basis of the conceptual structures the physician has built up in his or her own experience--experience that may have been gained by interpreting the language in medical books, by interpreting tests, and by interpreting the treatment of prior patients. Physicians may tend to call all these elements "facts"; but these elements, including the chemical analyses and the

reading of instruments that constitute their tests, are facts only in the context of such theoretical models as have turned out to be useful (cf. Fleck, 1935).

To return to education, the constructivist teacher will not be primarily interested in observable results, but rather in what students *think* they are doing and *why* they believe that their way of operating will lead to the solution of the problem at hand. The rationale of this shift of focus is simple: if one wants to generate understanding, the reasons why a student operates in a certain way are far more indicative of the student's stage of conceptual development than whether or not these operations lead to a result that the teacher finds acceptable. This, of course, is the reason why the best teachers have always paid more attention to the sources of mistakes than to the how of students' correct answers.

Where teachers have been able to organize these notions to formulate relatively generalizable, coherent models of the required cognitive processes and the heuristics to influence them, they have scored remarkable successes (Cobb, 1987; Steffe et al., 1983). The most wide-spread effect, however, has been achieved by the very simple constructivist principle that consists in taking whatever the student produces as a manifestation of something that *makes sense* to the student. This not only improves the general climate of instruction but also opens the way for the teacher to arrive at an understanding of the student.

From this perspective, it is not surprising that the constructivist approach should have some application in the field of psychotherapy as well. It is difficult to imagine that a therapist who does not construct an hypothetical model of the client, could have much influence on the client's cognitive processes and their emotional corollaries.

VII. CONCLUSION

The brief historical survey at the beginning of this chapter isolated four key ideas of Radical Constructivism:

1. **Scepticism.** The sceptics' irrefutable proposition that the Truth of what we would call "knowledge of the world" cannot be assessed or demonstrated because the "representations" of which it is supposed to consist can never be compared with what they are supposed to represent.
2. **Scientific Truth.** The separation of metaphysical beliefs and convictions, which purport to reflect an ontological reality, from rational/scientific knowledge, which is given an *instrumental* function in the living organisms' management of their subjective experiential reality.
3. **Conceptual Construction.** The notion of *cognitive construction* based on Vico's proposal to consider "facts", i.e., the experiential elements out of which organisms "make" (Latin: *facere*) or *construct* their experiential worlds, and the possibility of modelling this process of construction.
4. **Adaptation.** The abstraction of the conceptual pattern inherent in the theory of evolution from the original biological contents and the application of the concepts of *variation, selection, adaptation,* and *viability* to the realm of cognition.

One important consequence of integrating the four key ideas is the *radical* change in the relation between "knowledge" and "ontological reality" from an iconic relation of "representation" or "correspondence" to a relation of *functional fit*. It is the acceptance of this change of epistemic relation that differentiates Radical Constructivism from other forms of constructivism or constructionism.

Once this change of epistemic relation is understood, it becomes clear that Radical Constructivism does not *deny* ontological reality--it merely denies that a cognitive organism, whose knowledge derives from making distinctions and operating with the resulting "differentiata", can come to *know* any ontologically "real" world.

The experiential world in which human knowers find themselves living is *constructed*, because it is the result of the cognitive agents' own distinguishing and relating, beginning with the individual's distinction between the self and the experiential world. The highest, most reliable level of experiential reality then arises through interaction with those entities in the individual's experiential field that have been categorized as *others*. This "social" interaction yields, on the one hand, the only *objectivity* feasible in the constructivist model and, on the other, an epistemological basis for the elaboration of ethics.

The value of the constructivist model--and I emphasize once more that Radical Constructivism makes no ontological claims and is intended as no more, but also no less, than a useful model of knowledge and the activity of knowing--will have to be determined by its application to basic problems we run into in the construction of our experiential worlds.

As an example, I briefly specify some features of the ongoing applications in the area of education where the radical constructivist principles bring about a profound change of attitude towards the process of *learning* and the mental operations of the students. The most important of these changes derives from the constructivist assumption that, under normal circumstances, what a cognizing subject produces as an attempt to solve a problem or as an answer to a question, ought to be taken as a manifestation of something that *makes sense* in that subject's present construction of his or her experiential world. The teacher--and I suspect, also the psychotherapist--who wants to modify some concept or conceptual operation in the student or client, must therefore begin by constructing a viable model of that particular subject's ways and means of organizing experiences. An important ingredient of success in both these vocations therefore seems to be what Vico called "poetic imagination", for part of the practitioners' task is the hypothetical reconstruction of another's construction of an experiential world.

Finally, I would like to add that the constructivist orientation, as other proponents have claimed, does lead to greater *tolerance* in social interactions. This tolerance springs from the realization that neither problems nor solutions are ontological entities, but arise out of particular ways of constructing. Hence, no solution to an experiential problem can be "right" in an ontological sense. The world in which the problem arises depends on a way of *seeing*, a way of experiencing; and where there is one solution there are always others--but this does not entail that one *like* them all equally well.

Radical Constructivism claims, as did Ceccato and Piaget, that perception and all forms *of seeing*, be they sensory or conceptual, are the result of operations that have to be carried out by an active subject. In this sense the acting subject is responsible for the experiential world it constructs. It does not take much to notice that constraints prevent us from constructing everything we might like, but this should not obscure the fact that we need not like everything we do construct. Ethics, therefore, is not to be avoided: when we don't like the results of our operations, we have to change our way of operating.

References

Bentham, J., *Theory of fictions*. (Edited by C.K.Ogden) London: Routledge & Kegan Paul, 1932.

Bogdanov, A., Science and philosophy. In *Essays on the philosophy of collectivism, Vol.I.*, St.Petersburg, 1909. (Unpublished German translation by I. Maschke-Luschberger, Bielefeld, 1987.)

Bridgman, P.W., *The nature of physical theory*. Princeton University Press, 1936.

Campbell, D. Evolutionary epistemology. In P.Schilpp (Ed.), *The philosophy of Karl Popper*, LaSalle, IL: Open Court, 1974.

Ceccato, S., *Un tecnico fra i filosofi, Vols. I & II*. Padua: Marsilio, 1964-66.

Cobb, P., An investigation of young children's academic arithmetic contexts. *Educational Studies in Mathematics*, 1987, **18**, 109-124.

Feyerabend, P. *Farewell to reason*. London/New York: Verso, 1987.

Fleck, L. *Entstehung und Entwicklung einer wissenschaftlichen Tatsache*. Leipzig: Benno Schwabe, 1935. (English translation by F. Bradley & T.J.Trenn, University of Chicago Press, 1979.)

James, W. Great men, great thoughts, and the environment. *The Atlantic Monthly*. 1880, **46**(276), 441-459.

Jensen, K.M. *Beyond Marx and Mach--Aleksandr Bogdanov's Philosophy of living experience*. Dordrecht: Reidel, 1978

Kuhn, T.S. *The structure of scientific revolutions*. Chicago University Press, 1962.

Lorenz, K. *Behind the mirror*. New York: Harcourt Brace Jovanovich, 1977. (German original, 1973.)

Mach, E. *Erkenntnis und Irrtum*. Leipzig: Johann Ambrosius Barth, 1905.

Maturana, H., Reality: The search for objectivity or the quest for a compelling argument. *The Irish Journal of Psychology*, 1988, **9**(11), 25-82.

Meyendorff, J. *Byzantine theology*. New York: Fordham University Press, 1974. (I owe this reference to a personal communication from John Dixon, October 1984.)

Piaget, J. *La construction du reel chez l enfant*. Neuchatel: Delachaux et Niestle, 1936.

Piaget, J. *Biologie et connaissance*. Paris: Gallimard, 1967.

Piaget, J. *Six psychological studies*. (Translation by A.Tenzer & D.Elkind) New York: Vintage Books, 1967.

Popper, K. *Conjectures and refutations* (1963). New York: Harper Torchbooks, 1968.

Rorty, R. Method and morality. In N.Haan, R.N.Bellah, P.Rabinow, & W.M.Sullivan (Eds.), *Social science as moral inquiry*. New York: Columbia University Press, 1983.

Spencer Brown, G. *Laws of form*. London: Allen & Unwin, 1969.

Steffe, L.P., von Glasersfeld, E., Richards, J., & Cobb, P. *Children's counting types: Philosophy, theory, and application*. New York: Praeger, 1983.

Vaihinger, H. *Die Philosophie des Als Ob*. Berlin: Reuther & Reichard, 1913.

Vico, G-B. *De antiquissima Italorum sapientia* (1710). Naples: Stamperia de' Classici, 1858.

von Glasersfeld, E. Piaget and the radical constructivist epistemology. In C.D.Smock & E.von Glasersfeld (Eds.), *Epistemology and education*. Athens, GA: Follow Through Publications, 1974.

von Glasersfel, E. An interpretation of Piaget's constructivism, *Revue Internationale de Philosophie*, 1982, 36(4), 612-635.

von Glasersfeld, E. On the concept of interpretation, *Poetics*, 1983, *12*, 207-218.

von Glasersfeld, E. Reconstructing the concept of knowledge. *Archives de Psychologie*, 1985, **53**, 91-101.

von Glasersfeld, E. Steps in the construction of "others" and "reality". In R.Trappl (Ed.), *Power, autonomy, Utopia*. New York/London: Plenum Press, 1986.

Watzlawick, P. *Die erfundene Wirklichkeit*. Munich: Piper, 1981. (English translation: *The invented reality*, New York: Norton, 1984.)

Footnotes

1. The term "Radical Constructivism" was introduced in von Glasersfeld (1974) and a full description of the model was presented in Paul Watzlawick's *Die erfundene Wirklichkeit* (1981); the distinction from the "trivial" versions of constructivism was first made in von Glasersfeld (1985).

2. Kant was clearest about this in the 1st edition of the *Kritik* (1881) and in his *Prolegomena to any future metaphysics* (1883). As Schopenhauer observed, Kant unfortunately decided to "soften" his position in the 2nd edition of the Kritik (1887).

3. The origin of instrumentalism is well described in chapter 3 of Karl Popper's *Conjectures and Refutations* (1963).

4. An summary of Bentham's work was compiled by C.K.Ogden and published in the United States by Littlefield, Adams, & Co., 1959; the quoted passage is on p.XXXII.

5. Both Piaget and Ceccato, who hardly ever explicitly agree with other authors, gave an honorable mention to Percy Bridgman for his revolutionary idea of defining concepts in terms of the operations that give rise to them. It was extremely unfortunate for American psychology that the behavioristic establishment propagated the absurd notion that the operations that generate concepts had to be *physical operations.* Bridgman's important contribution, however, was the insight that the physical world, in order to be conceptualized, required *mental operations* on the part of the observer. See: Bridgman (1936).

6. A superb survey of "Evolutionary epistemology" was compiled by Donald Campbell (1974).

7. An English condensation of Vaihinger's work was published by C.K.Ogden in the 1930s. The German original was recently made available by the Scientia Verlag Aalen in Hamburg.

8. Konrad Lorenz (1973) incidentally falls into the same trap when he argues that the fact that human organisms have evolved and successfully use the categories of space and time, *proves* that these categories pertain to an "objective" reality (1937, p.9-10).

9. Prominent among them is Aleksandr Bogdanov (to whose ideas I was introduced by Vadim Sadovsky), a revolutionary prodigy and long-term friend of Lenin's, who disagreed with him on epistemology. For Bogdanov "the objective or physical has no existence apart from man; it is socially created and subject to continual renewal and re-creation in accord with the collective needs of man"

G.M.Jensen, 1978; p.130). No less important was Ernst Mach, of whom Paul Feyerabend (1987) has outlined a timely re-evaluation.

10. In this I am following Piaget (1937), who showed how the child is able to construct the concepts of space and time *without* the assumption of their objective reality. (With this, as with most of Piaget's works, I cite the French original because the English translations are, to say the least, not very reliable.)

11. The term "distinctions" was used by Spencer Brown (1969) and at much the same time by Maturana; Ceccato called them "differentiata" and Kant referred to the totality of possible distinctions as "*das Mannigfaltige*" (the manifold).

12. A more extensive treatment of the constructivist view of language and communication can be found in my "On the concept of interpretation" (1983).

13. It lies beyond the scope of this article to show the inherent uncertainty of explanatory models in the "hard" sciences (cf. Kuhn, 1962, and Popper 1963).

Acknowledgment

I am fortunate to have had many discussions with Heinz von Foerster and Humberto Maturana during the last fifteen years. Both have profoundly influenced my thinking and helped me to express myself more clearly.

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